### § 86.1362 Steady-state testing with a ramped-modal cycle.

This section describes how to test engines under steady-state conditions.

(a) Measure emissions by testing the engine on a dynamometer with the following ramped-modal duty cycle to determine whether it meets the applicable steady-state emission standards:

| RMC Mode | Time in mode (seconds) | Engine speed [1] [2] | Torque (percent) [2] [3] |
|---|---|---|---|
| 1a Steady-state | 170 | Warm Idle | 0. |
| 1b Transition | 20 | Linear Transition | Linear Transition. |
| 2a Steady-state | 173 | A | 100. |
| 2b Transition | 20 | Linear Transition | Linear Transition. |
| 3a Steady-state | 219 | B | 50. |
| 3b Transition | 20 | B | Linear Transition. |
| 4a Steady-state | 217 | B | 75. |
| 4b Transition | 20 | Linear Transition | Linear Transition. |
| 5a Steady-state | 103 | A | 50. |
| 5b Transition | 20 | A | Linear Transition. |
| 6a Steady-state | 100 | A | 75. |
| 6b Transition | 20 | A | Linear Transition. |
| 7a Steady-state | 103 | A | 25. |
| 7b Transition | 20 | Linear Transition | Linear Transition. |
| 8a Steady-state | 194 | B | 100. |
| 8b Transition | 20 | B | Linear Transition. |
| 9a Steady-state | 218 | B | 25. |
| 9b Transition | 20 | Linear Transition | Linear Transition. |
| 10a Steady-state | 171 | C | 100. |
| 10b Transition | 20 | C | Linear Transition. |
| 11a Steady-state | 102 | C | 25. |
| 11b Transition | 20 | C | Linear Transition. |
| 12a Steady-state | 100 | C | 75. |
| 12b Transition | 20 | C | Linear Transition. |
| 13a Steady-state | 102 | C | 50. |
| 13b Transition | 20 | Linear Transition | Linear Transition. |
| 14 Steady-state | 168 | Warm Idle | 0. |

[1] Speed terms are defined in 40 CFR part 1065.
[2] Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the speed or torque setting of the current mode to the speed or torque setting of the next mode.
[3] The percent torque is relative to maximum torque at the commanded engine speed.

(b) Perform the ramped-modal test as described in 40 CFR part 1065.

(c) For 2007 through 2010 model years, manufacturers may follow the mode order described in this paragraph (c) instead of the mode order specified in paragraph (a) of this section. Any EPA testing with these engines will rely on the same procedure used by the manufacturer for certification.

| RMC Mode | Time in mode (seconds) | Engine speed [1] [2] | Torque (percent) [2] [3] |
|---|---|---|---|
| 1a Steady-state | 170 | Warm Idle | 0. |
| 1b Transition | 20 | Linear Transition | Linear Transition. |
| 2a Steady-state | 170 | A | 100. |
| 2b Transition | 20 | A | Linear Transition. |
| 3a Steady-state | 102 | A | 25. |
| 3b Transition | 20 | A | Linear Transition. |
| 4a Steady-state | 100 | A | 75. |
| 4b Transition | 20 | A | Linear Transition. |
| 5a Steady-state | 103 | A | 50. |
| 5b Transition | 20 | Linear Transition | Linear Transition. |
| 6a Steady-state | 194 | B | 100. |
| 6b Transition | 20 | B | Linear Transition. |
| 7a Steady-state | 219 | B | 25. |
| 7b Transition | 20 | B | Linear Transition. |
| 8a Steady-state | 220 | B | 75. |
| 8b Transition | 20 | B | Linear Transition. |
| 9a Steady-state | 219 | B | 50. |
| 9b Transition | 20 | Linear Transition | Linear Transition. |
| 10a Steady-state | 171 | C | 100. |
| 10b Transition | 20 | C | Linear Transition. |
| 11a Steady-state | 102 | C | 25. |
| 11b Transition | 20 | C | Linear Transition. |

| RMC Mode | Time in mode (seconds) | Engine speed [1] [2] | Torque (percent) [2] [3] |
|---|---|---|---|
| 12a Steady-state | 100 | C | 75. |
| 12b Transition | 20 | C | Linear Transition. |
| 13a Steady-state | 102 | C | 50. |
| 13b Transition | 20 | Linear Transition | Linear Transition. |
| 14 Steady-state | 168 | Warm Idle | 0. |

[1] Speed terms are defined in 40 CFR part 1065.
[2] Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the speed or torque setting of the current mode to the speed or torque setting of the next mode.
[3] The percent torque is relative to maximum torque at the commanded engine speed.

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### § 86.1370 Not-To-Exceed test procedures.

(a) *General.* The purpose of this test procedure is to measure in-use emissions of heavy-duty diesel engines while operating within a broad range of speed and load points (the Not-To-Exceed Control Area) and under conditions which can reasonably be expected to be encountered in normal vehicle operation and use. Emission results from this test procedure are to be compared to the Not-To-Exceed Limits specified in §86.007–11(a)(4), or to later Not-To-Exceed Limits. The Not-To-Exceed Limits do not apply for engine-starting conditions. Tests conducted using the procedures specified in this subpart are considered valid Not-To-Exceed tests (Note: duty cycles and limits on ambient conditions do not apply for Not-To-Exceed tests).

(b) *Not-to-exceed control area for diesel heavy-duty engines.* The Not-To-Exceed Control Area for diesel heavy-duty engines consists of the following engine speed and load points:

(1) All operating speeds greater than the speed calculated using the following formula, where $n_{hi}$ and $n_{lo}$ are determined according to the provisions in §86.1360(c):

$$n_{lo}+0.15\times(n_{hi}-n_{lo})$$

(2) All engine load points greater than or equal to 30% or more of the maximum torque value produced by the engine.

(3) Notwithstanding the provisions of paragraphs (b)(1) and (2) of this section, all operating speed and load points with brake specific fuel consumption (BSFC) values within 5% of the minimum BSFC value of the engine. For the purposes of this requirement, BFSC must be calculated under the general test cell conditions specified in 40 CFR part 1065. The manufacturer may petition the Administrator at certification to exclude such points if the manufacturer can demonstrate that the engine is not expected to operate at such points in normal vehicle operation and use. Engines equipped with drivelines with multi-speed manual transmissions or automatic transmissions with a finite number of gears are not subject to the requirements of this paragraph (b)(3).

(4) Notwithstanding the provisions of paragraphs (b)(1) through (b)(3) of this section, speed and load points below 30% of the maximum power value produced by the engine shall be excluded from the Not-To-Exceed Control Area for all emissions.

(5) [Reserved]

(6)(i) For petroleum-fueled diesel cycle engines, the manufacturer may identify particular engine-vehicle combinations and may petition the Administrator at certification to exclude operating points from the Not-to-Exceed Control Area defined in paragraphs (b)(1) through (5) of this section if the manufacturer can demonstrate that the engine is not capable of operating at such points when used in the specified engine-vehicle combination(s).

(ii) For diesel cycle engines that are not petroleum-fueled, the manufacturer may petition the Administrator at certification to exclude operating points from the Not-to-Exceed Control Area defined in paragraphs (b)(1) through (5) of this section if the manufacturer can demonstrate that the engine is not expected to operate at such points in normal vehicle operation and use.

(7) Manufacturers may petition the Administrator to limit NTE testing in a single defined region of speeds and